California Regional Water Quality Control Board

Central Valley Region

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TO: Gordon Lee Boggs

FROM: Jon B. Marshack, D.Env.
Senior Environmental Specialist
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DATE: 1 May 2000

SIGNATURE:

SUBJECT: BENEFICIAL USE-PROTECTIVE WATER QUALITY LIMITS FOR COMPONENTS OF PETROLEUM-BASED FUELS

Request:
In a 17 May 1995 memorandum to staff, I summarized available water quality limits for petroleum fuel constituents and additives. You have asked whether any numerical limits cited in that memorandum had been updated.

Response:
Yes. Many of the cited limits have been updated. Additional limits are currently being developed. The discussion below presents the information contained in my 17 May 1995 memorandum, along with updated and pending numerical limits in the attached tables.

Discussion:
A significant amount of our work involves the assessment and mitigation of petroleum-based fuel spills into soil and water. Various water quality criteria have been cited by staff in determining whether beneficial uses have been impaired or threatened by such spills. In an effort to achieve uniformity in the use of numerical water quality limits for this purpose and to bring to your attention the wide range of available and relevant criteria, I offer the list on the following pages. These values come from the staff report *A Compilation of Water Quality Goals*, March 1998 edition, along with more recent information. These limits are intended to be used to interpret applicable Basin Plan water quality objectives for the protection of existing or potential sources of drinking water. Sources of drinking water are surface and ground waters which have the beneficial use of municipal and domestic supply (MUN), as designated in the applicable *Water Quality Control Plan* (Basin Plan) or the State Water Board "Sources of Drinking Water" Policy, Resolution No. 88-63. Water quality objectives applicable to such waters include California drinking water MCLs and narrative objectives prohibiting toxicity and adverse tastes and odors. Where available, numerical water quality limits are presented to implement each of these objectives. The most stringent of the listed limits for each chemical would implement all three objectives. Objectives protective of aquatic life are not included in this list. As such, additional numerical limits may apply to surface waters in addition to those contained in this memorandum.

Several of the recommended values are based on the taste and odor which these chemicals can impart to water. For these chemicals, impacts on the palatability of the water occurs at lower concentrations than

those which cause health effects. Taste- and odor-related criteria are applicable, since both health effects and palatability are relevant to the assessment of beneficial use protection.
You will notice that certain of the recommended limits are lower than applicable analytical detection limits in water. In these cases, the detection of any amount of these constituents in water indicates that beneficial uses have been impaired.

In addition, an assessment of existing and potential water quality impacts must take into account State Water Board Resolution Nos. 68-16, *Statement of Policy With Respect to Maintaining High Quality of Waters in California*, and 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*. Requiring cleanup to technologically and economically achievable levels which are lower than beneficial use-protective limits, would be consistent with these policies for water quality control.

Attachment

JBM\Jon HD 1\Documents\W. Q. Goals\Memos\Goals for Fuels 2000

RECOMMENDED LIMITS IN WATER FOR PETROLEUM-BASED FUEL COMPONENTS TO PROTECT THE BENEFICIAL USE OF MUNICIPAL AND DOMESTIC SUPPLY

Aromatic Hydrocarbons —			
Benzene	1.0	µg/l	California Primary MCL[1]
	0.35	µg/l	1-in-a-million incremental cancer risk level (OEHHA)[2]
	0.14	µg/l	Draft CA Public Health Goal in drinking water (OEHHA)
n-Butylbenzene	45	µg/l	California Drinking Water Action Level (DHS)
Ethylbenzene	700	µg/l	California and USEPA Primary MCL[1]
	29	µg/l	Taste and odor threshold (USEPA)[3]
Isopropylbenzene (Cumene)	700	µg/l	USEPA IRIS reference dose[11]
	0.8	µg/l	Taste and odor threshold[12]
Toluene	150	µg/l	California Primary MCL[1]
	150	µg/l	California Public Health Goal in drinking water (OEHHA)
	42	µg/l	Taste and odor threshold (USEPA)[3]
1,3,5-Trimethylbenzene	15	µg/l	Taste and odor threshold[12]
Xylenes (sum of isomers)	1,750	µg/l	California Primary MCL[1]
	17	µg/l	Taste and odor threshold (USEPA)[3]
Aliphatic Hydrocarbons —			
n-Hexane	400	µg/l	USEPA Health Advisory[4]
	6.4	µg/l	Taste and odor threshold[12]
Hydrocarbon Mixtures —			
Diesel or Kerosene	100	µg/l	Taste and odor threshold (USEPA)[5]
Gasoline	5	µg/l	Taste and odor threshold (SWRCB)[6]
Additives —			
Lead	15	µg/l	CA and USEPA Drinking Water MCL Action Level[7]
	2	µg/l	California Public Health Goal in drinking water (OEHHA)
Ethylene dibromide (EDB)	0.05	µg/l	California and USEPA Primary MCL[1]
	0.0097	µg/l	1-in-a-million incremental cancer risk level (OEHHA) [2]
Ethylene dichloride[8]	0.5	µg/l	California Primary MCL[1]
	0.4	µg/l	California Public Health Goal in drinking water (OEHHA)
	7,000	µg/l	Taste and odor threshold[12]
Methyl t-butyl ether (MtBE)	13	µg/l	California Primary MCL[13]
	5	µg/l	California Secondary MCL
Di-isoproply ether (DIPE)	0.8	µg/l	Taste and odor threshold[12]
t-Butyl Alcohol (TBA)	12	µg/l	California Drinking Water Action Level (DHS)
	290,000	µg/l	Taste and odor threshold[12]
Ethanol	760,000	µg/l	Taste and odor threshold[12]
Methanol	3,500	µg/l	USEPA IRIS reference dose[11]
	740,000	µg/l	Taste and odor threshold[12]

Footnotes are listed on the next page.

Polynuclear Aromatic Hydrocarbons (PAHs or PNAs) —

Carcinogenic PAHs[9]	0.0029	µg/l	1-in-a-million incremental cancer risk level (OEHHA)[2]
Acenaphthene	420	µg/l	USEPA IRIS reference dose[11]
	20	µg/l	USEPA NAWQC[10] (taste and odor)
Anthracene	2100	µg/l	USEPA IRIS reference dose[11]
Benzo(a)pyrene	0.2	µg/l	California and USEPA Primary MCL[1]
	0.0029	µg/l	1-in-a-million incremental cancer risk level (OEHHA)[2]
Dibenz(a,h)anthracene	0.0085	µg/l	1-in-a-million incremental cancer risk level (OEHHA)[2]
Naphthalene	20	µg/l	USEPA Health Advisory
	21	µg/l	Taste and odor threshold[12]

Notes:
1) Primary MCLs are health based, but also reflect other factors relating to technologic and economic feasibility of attainment and monitoring in a water distribution system and at the tap, not necessarily in the water resource.
2) Derived from oral cancer potency factor published by the California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, assuming 2 liters/day water consumption and 70 kg body weight.
3) Federal Register, Vol. 54, No. 97, pp. 22138,22139.
4) Health advisory = 4000 µg/l for 10 day exposure or less. No lifetime exposure advisory has been developed. However, lifetime health advisories are normally at least ten-fold lower than 10-day advisories. Therefore, a level of 400 µg/l would be a reasonable estimate of a lifetime protective level for n-hexane.
5) Health Advisory. Document states that the 100 µg/l level should be health protective for 10 days of exposure or less. No lifetime exposure advisory has been developed. However, lifetime health advisories are normally at least ten-fold lower than 10-day advisories. Therefore, a level of 10 µg/l would be a reasonable estimate of a lifetime health protective level for diesel or kerosene.
6) McKee & Wolf, Water Quality Criteria, 2nd Ed., State Water Resources Control Board (1963, 1978) p. 230.
7) Liability under Proposition 65 may also exist for responsible parties where levels in water exceed 0.25 µg/l.
8) Also know as 1,2-dichloroethane.
9) Based on benzo(a)pyrene; see 22 CCR §12000 (Proposition 65) for list of carcinogens; criteria for individual PAHs may be calculated by dividing cancer risk level by weighting factors (PEFs) in the table on the following page.
10) National Ambient Water Quality Criteria.
11) Integrated Risk Information System; listed value assumes 2 liters/day water consumption, 70 kg body weight, and 20% relative source contribution from drinking water.
12) J.E. Amoore and E. Hautala, *Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 214 Industrial Chemicals in Air and Water Dilution*, Journal of Applied Toxicology, Vol. 3, No. 6 (1983).
13) Effective 17 May 2000.

Office of Environmental Health Hazard Assessment (OEHHA)
Weighting Scheme for Polyaromatic Hydrocarbons (PAH's)

PAH or derivative	CAS number	Suggested PEF
benzo[a]pyrene	50-32-8	1.0 (index compound)
benz[a]anthracene	56-55-3	0.1
benzo[b]fluoranthene	205-99-2	0.1
benzo[j]fluoranthene	205-82-3	0.1
benzo[k]fluoranthene	207-08-9	0.1
dibenz[a,j]acridine	224-42-0	0.1
dibenz[a,h]acridine	226-36-8	0.1
7H-dibenzo[c,g]carbazole	194-59-2	1.0
dibenzo[a,e]pyrene	192-65-4	1.0
dibenzo[a,h]pyrene	189-64-0	10
dibenzo[a,i]pyrene	189-55-9	10
dibenzo[a,l]pyrene	191-30-0	10
indeno[l ,2,3-c,d]pyrene	193-39-5	0.1
5-methylchrysene	3697-24-3	1.0
l-nitropyrene	5522-43-0	0.1
4-nitropyrene	57835-92-4	0.1
1,6-dinitropyrene	42397-64-8	10
1,8-dinitropyrene	42397-65-9	1.0
6-nitrocrysene	7496-02-8	10
2-nitrofluorene	607-57-8	0.01
chrysene	218-01-9	0.01

This weighting scheme for PAH's was developed by the Air Toxicology and Epidemiology Section (ATES) of the Office of Environmental Health Hazard Assessment (OEHHA) in the document entitled Health Effects of Benzo[a]pyrene. The nitro PAHs are those listed as IARC class 2B. Although chrysene is an IARC class 3 carcinogen, USEPA classifies it as B2. The justification for each PEF is detailed in Appendix A of the document entitled the Health Effects of Benzo[a]pyrene.

These PEF's may be used for both inhalation and oral exposure pathways, although data used for their development was prioritized so inhalation exposure was given higher priority than other routes of exposure. When a specific potency value is developed for a chemical it should be used in place of the PEF.